

Redescription of *Pelicope yuccamica* Mason (Hymenoptera: Braconidae: Microgastrinae), With Notes on its Unusual Biology and Relationships

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Abstract.—A more complete illustrated redescription of the monotypic genus *Pelicope* (type species *P. yuccamica* Mason) is provided to assist in phylogenetic placement of this rare and unusual genus. Misinterpretations of its biology are corrected based on host data published after the original description—this species appears not to be associated with *Yucca* as previously reported, but instead only with the incurvariid moth *Mesepiola specca* Davis, a seed-feeder on *Nolina parryi* Watson (Ruscaceae).

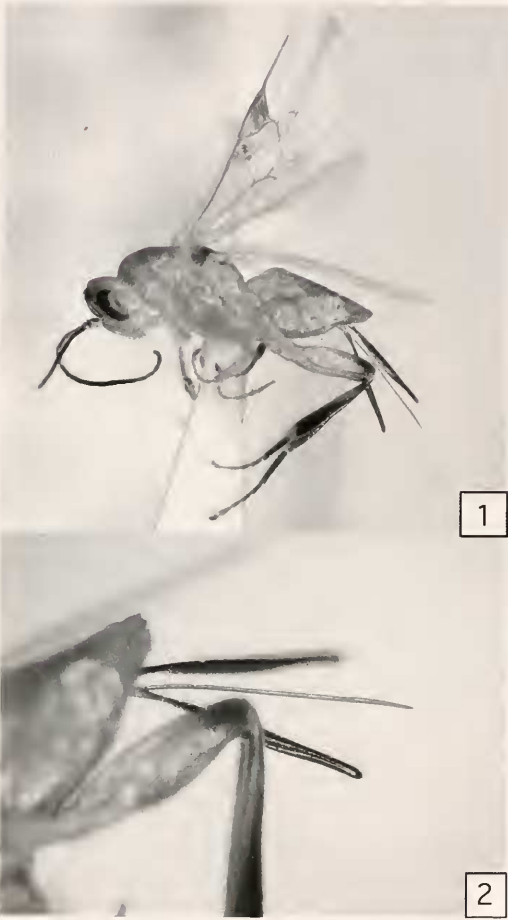
The monotypic genus *Pelicope* was erected by Mason in his reclassification of the world genera of Microgastrinae (Mason 1981). He included only the new species *P. yuccamica* Mason, a highly distinctive, polished, xanthic species reported as having only been collected in a restricted region of southern California at *Yucca* flowers. Mason characterized the genus as having a rare combination of morphological traits within the subfamily Microgastrinae—the almost totally xanthic body coloration, the absence of the hind wing vein 2r-m, and the resemblance of the fore wing areolet (Fig. 7) to the fossil genus *Eocardiocliles* described from Baltic Amber by Brues (1933), make this genus very peculiar and (in Mason's view) difficult to classify as closely related to any other genus.

Mason's (1981) description was based on six specimens, all taken from the same locality and month in Riverside County (Upper Deep Canyon at Horsethief Creek in early June), but collected over a 26 year period. In addition to a verbal description, he provided simple but accurate line drawings of the head, wings, anterior mesosomal tergites and female ovipositor

mechanism. Interestingly, he omitted in the description a number of observable features that might have helped place the genus in his new classification. Although the type series contained males, no mention of male genitalic features was made, and a number of other small features relevant to comparative study of microgastrine genera were also not mentioned.

The phylogeny and classification of microgastrine genera has remained controversial and difficult to resolve (e.g. Mason 1981, Austin 1990, Walker et al. 1990, Maëtô 1996, Whitfield et al. 2002), in part due to the lack of data for a number of genera. In this context, a more complete description of *Pelicope* has been of interest for some time. Further, a number of other aspects of *P. yuccamica* have now come to light, some of them scattered enough in the literature and collections that it has only recently become possible to integrate them into a fuller picture of this remarkable species.

Biology.—Force (1989), in a study of the biology of the incurvariid moth *Mesepiola specca* Davis, whose larvae feed on the seeds of *Nolina parryi* (previously in Agavaceae, now reclassified in the Rusca-



Figs. 1–2. 1, Lateral habitus photo of *Pelicope yuccamica* Mason, female, reared from *Mesepiola specca*. 2, close-up of ovipositor and sheaths.

ceae—butterfly's broom family—Judd et al. 2002), reared a series of *P. yuccamica*, from which we have been able to examine specimens. Since extensive studies of yucca/yucca moth biology and coevolution (reviewed in Pellmyr 2003) have apparently never yielded *Pelicope* (O. Pellmyr, personal communication), it seems clear now that the earlier records of *Pelicope* as being associated with *Yucca* were based on misidentifications of *Nolina* as *Yucca*, which it does indeed superficially resemble, although the two are now in different plant families.

Force (1989) discussed an interesting problem for specialist parasitoids attack-

ing *M. specca*. *Nolina parryi* does not flower (and thus does not produce seeds) every year, but does so irregularly and synchronously in local areas. *Mesepiola* appears to be able to synchronize with *Nolina* somehow (although it also has two other less common recorded hosts which might occasionally fill in). Either *Pelicope* has other local hosts besides *M. specca* (or can find the occasional *M. specca* on its other host plants), or it too has found some way to synchronize its emergence with the flowering years of *Nolina*. Perhaps the latter strategy might explain why so few *Pelicope* have ever been collected in an area rich in entomologists.

Force (1989) also states that *Pelicope* are likely to be ovipositing into host eggs, although he does not discount that they could be finding very early instar larvae. Oviposition into eggs does not appear to be common in Microgastrinae, but is known to occur in some *Cotesia* and *Diolcogaster* species (Ruberson and Whitfield, 1986). Since Force's observations were indirect in the sense that he drew conclusions based on the timing of host oviposition and *Pelicope* adult activity rather than on direct *Pelicope* ovipositions, at this point the question must remain open.

More recent studies of Pelicope morphology.—Maetô (1996), in a comparative study of male genitalia (especially of volsellar structures) in Microgastrinae, partially described the male genitalia of *Pelicope* and presented a photo of a slide mounted genital capsule focusing on the digitus and cuspis structure. There were not enough characters in his study to confidently place the genus phylogenetically, but it did have a unique combination of the five characters polarized by Maetô in his discussion.

Whitfield et al. (2002) attempted to synthesize the available comparative morphological data for microgastrine genera (including some of Maetô's data and attempting to include the features considered by Mason) and analyzed these data alone and in combination with DNA se-

quence data from three gene fragments. Specimens of *Pelicope* suitable for molecular study were unavailable at that time, but several morphological characters were coded from the type series for the genus that were neither mentioned by Mason (1981) nor observable from his illustrations. The preliminary phylogenies based on both morphological and combined data appeared to confirm Mason's speculation that *Pelicope* represents an isolated, relatively basal lineage, but support for this position is still poor.

Below we provide a morphological re-description of *P. yuccamica*, expanding upon the description of Mason (1981) and the character codings of Whitfield et al. (2002) and providing a series of digital photographs and environmental scanning electron micrographs of a female specimen from Force's (1989) material. It is hoped that these additional data will improve the interpretation of the morphology of *Pelicope* for future phylogenetic work. In addition, we hope our clarification of the biology of *Pelicope* will stimulate further field studies of this unusual animal.

MATERIALS AND METHODS

The principal morphological terminology used in the species description is that of Huber and Sharkey (1993) as well as of Schuh (1989); except for that of the morphology of the propodeum, which is used *sensu* Townes (1969, Fig. E) and Austin and Dangerfield (1992, Fig. 1). The cuticular sculpturing terminology follows that of Harris (1979), while the terminology for the wing venation is a variation of the Comstock-Needham system used by Sharkey and Wharton (1997, Fig. 15).

Digital color photographs were taken using a JVC GC-QX5HD digital still camera mounted on a Leica MZ12/5 stereomicroscope. ESEM photographs were taken using a Philips XL30 ESEM-FEG electron microscope.

Pelicope yuccamica Mason (Figs. 1–9)

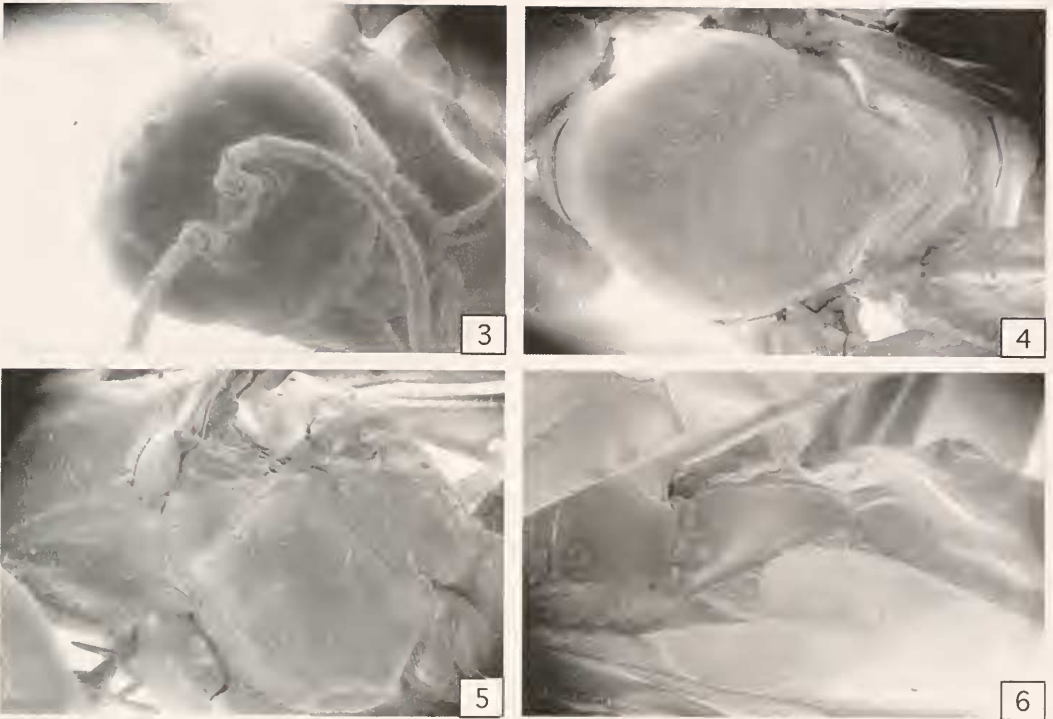
Body color.—Light golden yellowish-brown except for distal 1/5 of hind femur; hind tibia (at least apically) and tarsomeres dark brownish yellow; ovipositor sheaths and antennae beyond scape very dark brown to essentially black; ventral 1/3 of head anteriorly whitish.

Size.—Body length 3.1–3.5 mm. Forewing length 3.1–3.4 mm.

Head.—Face broad, very weakly sculptured; inner margins of eyes not converging ventrally, sometimes even weakly diverging. Clypeus broad, shallowly semi-circular above broad subtriangular labrum which largely conceals mandibles in frontal view. Antennae unusually thin and short for Microgastrinae (Fig. 1); placodes two-ranked on at least proximal 10 flagellomeres, and ventral area same as dorsal for subapical flagellomeres. Glossa truncate. Maxillary and labial palps slender, pale yellowish, relatively short.

Mesosoma.—Pronotal lateral area with two nitid grooves; propleuron lower outer corner simple (Fig. 5). Mesonotum shiny, nearly smooth, without or with very indistinct punctation, but with very smooth, broad, shallow suggestions of notauli and raised medial lobe (Fig. 4). Epicnemial carinae absent; mesopleura weakly sculptured except anterodorsally and near poorly defined sternaulus (Fig. 5). Scutoscutellar groove narrow, convex towards anterior, with very tiny shallow pits (Fig. 4). Scutellar disc subtriangular, very weakly punctate, slightly wider anteriorly than long; lunulae slightly curved dorsally and mainly of uniform width, with nitid medio posterior scutellar band. Metanotum with sub-scutellar hairs absent; anterior margin appressed to scutellum. Propodeum smooth, with more horizontal anterodorsal area greatly shortened and gradually curving to strongly declivous face, without carinae.

Legs.—Fore telotarsus normal in shape



Figs. 3–6. ESEM Photos of *P. yuccamica* female: 3, head, anterior view; 4, mesosoma, dorsal view; 5, mesosoma, lateral view; 6, anterior metasomal tergites, dorsal view.

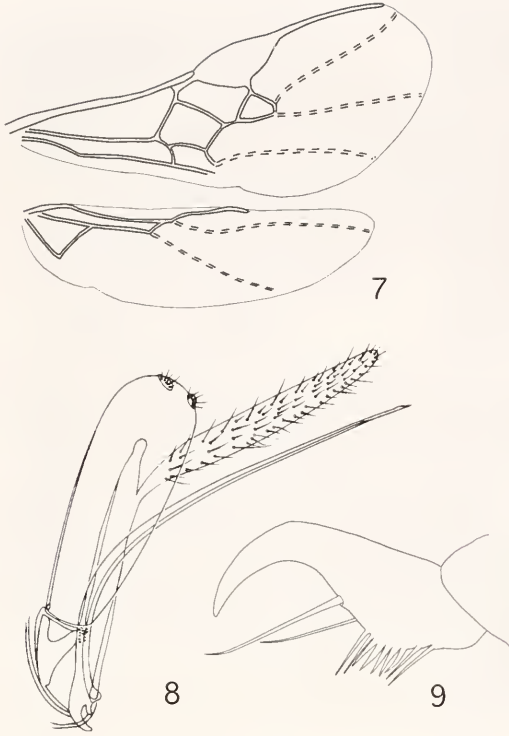
(not excavated apicoventrally). Hind coxae not strongly enlarged (thus resembling non-*Diolcogaster* Microgastrinae); hind tibial spurs subequal in length and about $\frac{1}{2}$ length of hind basitarsi; tarsal claws appearing simple under low magnification but actually bearing a cluster of 4–5 tiny slender teeth basally (Fig. 9).

Wings (Fig. 7).—Forewing vein 3Rs strongly convex towards costal vein, 1M+1Rs straight, r-m meeting 3Rsa to close the unusually large areolet, 2A absent. Stigma pale yellowish basally, otherwise brown; veins mostly yellowish brown. Hindwing veins r, 2A and 2r-m absent, cells 1R and 2R of approximately same width, veins 2Cu and cu-a straight; vannal lobe with a distinct apical notch, convex in shape and with setosity short and sparse beyond broadest point.

Metasoma.—First metasomal tergite with gentle anterior basal excavation rather than mediobasal longitudinal groove (Fig.

6), apical half flat to gently arched and without medioapical excavation, in dorsal view narrowing towards apex of tergum. Second metasomal tergite subtriangular and relatively small, appearing undefined posteriorly due to exceptionally weak posterior groove. Third metasomal tergum 1.5× as long as second tergite. General aspect of metasoma not carapacelike and with terga nitid. Medial longitudinal area of hypopygium desclerotized and with longitudinal pleats. Ovipositor mechanism (Fig. 8) with eighth tergite 3× taller (dorsoventrally) than long and with the apodeme shorter than wide; second valvifer tall and lorate; the slender straight ovipositor sheaths (Figs. 2, 8) arising from second valvifer near apex, setosity present through length; ovipositor in lateral view very weakly decurved and evenly tapered throughout its length.

Male genitalia (from Maetô, 1996—his Table 1 and Fig. 10).—Lamina volsellaris



Figs. 7–9. *P. yuccamica*, female: 7, wings; 8, ovipositor mechanism, lateral view; 9, hind tarsal claw. 7, 8 after Mason (1981); used with permission.

0.28 mm long, with 2 setae. Digitus 0.57× as long as lamina volsellaris, slender basally and apically acute and directly dorsally, but with ventral edge slightly convex; apex with 3–4 apical teeth.

Larva and cocoons.—Force (1989) states that *Pelicope* spend the winter in the soil in the host larvae and adults emerge the following late May/early June when the adult *Mesepiola* are ovipositing into developing seeds. Since the host spins a tough cocoon in the soil, probably the parasitoid cocoon is inconspicuous within it.

Material examined.—Holotype: USA, California, Riverside Co., Upper Deep Canyon at Horsethief Creek, 1000 m, 11/vi/1965, Col. E. Schlinger. Paratypes (2 ♀♀ and 3 ♂♂) and holotype in the U. S. National Museum. Additional specimen used for redescription and figures: USA: California: Riverside Co.: Pinyon Flat, 18/vi/1987, D. Force, ex. *Mesepiola* sp. seed *Nolina parryi* (in Illinois Natural History Survey collection).

ACKNOWLEDGMENTS

We would like to thank Drs. Henri Goulet (Canadian National Collection, Ottawa) and David Smith (U. S. National Museum, Washington) for the opportunity to examine *Pelicope* specimens in their care. Olle Pelmyr provided invaluable help on the question of whether *Pelicope* is associated with Yucca moths, and helped locate the Force paper. Scott Robinson of the Imaging Technology Group, Beckman Institute, University of Illinois, provided assistance with the ESEM photography. This work was supported in part by National Science Foundation grant DEB 0235784 and U. S. Department of Agriculture NRI grant 2003-35316-13679 to JBW.

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